

ISSUE DATE _____

☐ ITS
☒ NSR
☐ NITS

TMI-2
 DIVISION
 SYSTEM DESCRIPTION
 FOR

DEFUELING WATER CLEANUP

FUEL TRANSFER CANAL/SPENT

FUEL POOL CLEANUP SYSTEM

(ECA 3525-84-0041)

COG ENG K. K. Boldt DATE 8/27/84

RTR R. L. Mays DATE 8/27/84

COG ENG MGR. K. K. Boldt for K. L. B. B. DATE 8/27/84

5	12/15/85	See Summary on Page 3	<u>DRB</u>	<u>for K. B.</u>	<u>17</u>	<u>K. B.</u>
4	9/6/85	See Summary on Page 2	<u>DRB</u>	<u>for K. B.</u>	<u>17</u>	<u>K. B.</u>
3	3/19/85	See Change Summary on Page 2	<u>DRB</u>	<u>for K. B.</u>	<u>17</u>	<u>K. B.</u>
2	12/27/84	See Change Summary on page 2	<u>DRB</u>	<u>for K. B.</u>	<u>17</u>	<u>K. B.</u>
1	12/1/84	Added K-2 (see Change Summary)	<u>DRB</u>	<u>for K. B.</u>	<u>17</u>	<u>K. B.</u>
0	8/27/84	Issue For Use	<u>DRB</u>	<u>for K. B.</u>	<u>17</u>	<u>K. B.</u>
NO	DATE	REVISIONS	BY	CHECKED	GROUP SUPERVISOR	MGR DESIGN ENGINEERING
				CHIEF ENGR		

8602190108 860207
 PDR ADDCK 05000320
 P PDR

DOCUMENT PAGE 1 OF 25

**Nuclear**

NO.

15737-2-M72-DWC02

Title TMI-2 Division System Description for Defueling Water Cleanup -
Fuel Transfer Canal/Spent Fuel Pool Cleanup System

PAGE

OF

2

25

Rev.

SUMMARY OF CHANGE

- 1 DWC ion exchanger K-2 dedicated to FTC/SFP Cleanup System and made primary routing for Cs-137 removal with SDS now as a backup. Added to sections 1.3.1, 1.3.2, 1.6.3, 1.6.4, 2.1, 2.2, 3.1, 3.2, 3.4, 3.5 and 4.2 information on K-2 given previously in system description 2-M72-DWC01 (Ref. 13). Any information added to or changed from that given previously in Ref. 13 is listed below.
- 1 Added capability to bypass level switch on K-2 (section 3.5) for draining and filling.
- 1 Added low & high level set points for K-2 level switches LSL-40 and LSH-40.
- 1 Deleted plug valve V100. Now use V099 to isolate 4 inch hose on return line to the FTC.
- 1 Completed description of Ref. 18f. Added Ref. 18k through 18q, 19, 20, 21 and 22.
- 1 Added capability to route to K-2 & SDS simultaneously.
- 1 Inlet/Outlet manifolds for filter canisters are not skid mounted.
- 1 Normal operational mode now is 400 gpm from FTC filtered and returned to Fuel Pool A. 30 gpm is also processed in K-2.
- 1 Cesium concentration levels changed to read equivalent cesium concentration.
- 2 Deleted section 4.3; corrected ref. 22b; revised ion exchanger model, ASL-17 setpoint; made method of filling/refilling optional in sections 3.1 and .6; revised wording in section 4.4; corrected pump number in section 4.5; delete sentence section 2.3.
- 3 Added relief valves R-8, R-9, R-10, & R-11 to protect filter canisters. Added locations of sample points. Provided detailed information on sample boxes 1 and 2 and their exhaust systems. Deleted boronometer AE-17. Added references 18 r, s, t, u, 22 a, d, e, 23, and 24. Added precautions for pump changes and sample box 2 face velocity. Provided more detailed valve lineup for startup. Revised section 5.0 to delete forthcoming information.
- 4 Added reference 22f. Revised bubbler level alarm instrumentation, added flow indicator to sample box return lines. Revised alarm instrumentation for DPSH-22A/B. CLD system tie-in incorporated, noted that CLD-P-1 may be used to aid backflushing. Revised set point for filter canister loading and post filter loading.



Nuclear

NO.

15737-2-M72-DWC02

Title TMI Division System Description for Defueling Water Cleanup-
Fuel Transfer Canal/Spent Fuel Pool Cleanup System

PAGE 3 OF 25

Rev.

SUMMARY OF CHANGE

5

Noted that system may be configured to bypass filter canisters, revised mode of operations table, revised description of normal system operation, revised NTU value required for processing to 5.

TABLE OF CONTENTS

- 1.0 Design Description
 - 1.1 Summary
 - 1.2 References
 - 1.3 Detailed System Description
 - 1.3.1 Description
 - 1.3.2 System Components
 - 1.4 System Performance Characteristics
 - 1.5 System Arrangement
 - 1.6 Instrumentation and Control
 - 1.6.1 Controls
 - 1.6.2 Power
 - 1.6.3 Monitoring
 - 1.6.4 Trips
 - 1.7 System Interfaces
 - 1.8 Quality Assurance
- 2.0 System Limitation, Setpoints and Precautions
 - 2.1 Limitations
 - 2.2 Setpoints
 - 2.3 Precautions
- 3.0 Operations
 - 3.1 Initial Fill
 - 3.2 Startup
 - 3.3 Normal Operation
 - 3.4 Shutdown
 - 3.5 Draining
 - 3.6 Refilling
 - 3.7 Infrequent Operations
 - 3.8 Transient Operations
- 4.0 Casualty Events and Recovery Procedures
 - 4.1 Loss of Power
 - 4.2 Loss of Instrumentation/Instrument Air
 - 4.3 Deleted
 - 4.4 Filter Media Rupture
 - 4.5 Line and Hose Break
- 5.0 System Maintenance
- 6.0 Testing
 - 6.1 Hydrostatic Testing
 - 6.2 Leak Testing
 - 6.3 Instrument Testing
- 7.0 Human Factors

1.0 DESIGN DESCRIPTION

1.1 Summary

The fuel transfer canal/spent fuel pool cleanup system is a temporary liquid processing system which is designed to process water contained in the spent fuel pool and/or the fuel transfer canal. The system's major functions are:

- a) to filter the water contained in the spent fuel pool and/or the fuel transfer canal to remove suspended solids above a nominal .5 micron rating. This is done to maintain the clarity of the water. | 5
- b) to remove soluble fission products from the spent fuel pool or the fuel transfer canal by demineralization of the water. This is done to keep the equivalent Cs-137 concentration less than .02 $\mu\text{Ci/ml}$, excluding antimony, and thus reduce the dose rate contribution of the water. Also, a flowpath to EPICOR II via the RCBT's is provided to remove Sb-125 in the event that high Sb-125 levels are encountered. | 5

1.2 References

1. Planning Study, Defueling Water Cleanup System Doc. No. TPO/TMI-046
2. Technical Plan, Defueling Water Cleanup System Doc. No. TPO/TMI-047
3. Division I, System Design Description, Defueling Water Cleanup System Doc. No. 2-R72-DWC01
4. Bechtel Drawing 2-M74-DWC01, Defueling Water Cleanup (DWC) Reactor Vessel Cleanup System P&ID
5. Bechtel Drawing 2-M74-DWC02, Defueling Water Cleanup (DWC) Fuel Transfer Canal/Spent Fuel Pool Cleanup System P&ID
6. Bechtel Drawing 2-M74-DWC03, Defueling Water Cleanup (DWC) Auxiliary Systems P&ID
7. Bechtel Drawing 2-POA-6401, General Arrangement Fuel Handling Building Plan El. 347'-6"
8. Bechtel Drawing 2-POA-1303, General Arrangement Plenum Removal Reactor Building
9. DCN No. 2026-30-2, Flow Diagram Spent Fuel Cooling and Decay Heat Removal
10. Burns & Roe Drawing No. 2026, Flow Diagram Spent Fuel Cooling and Decay Heat Removal

11. GPU Drawing No. 2R-950-21-001 P&ID Composite Submerged Demineralizer System
12. TMI-2 Recovery Division System Design Description for Submerged Demineralizer System, Doc. No. SD 3527-005
13. Division System Design Description for Reactor Vessel Cleanup System, Doc. No. 15737-2-M72-DWC01
14. Instrument Index, Doc. No. 15737-2-J16-001
15. Design Engineering Valve List, Doc. No. 15737-2-P16-001.
16. Mechanical Equipment List, Doc. No. 15737-2-M16-001
17. Standard For Piping Line Specifications, Doc. No. 15737-2-P-001.
18. Bechtel Piping Isometrics
 - a) 2-P60-DWC01-DWCS-Pumps P-2A&B, P-3A&B, P-4A&B, and Miscellaneous Details
 - b) 2-P60-DWC02-DWCS - Reactor Vessel Filter Trains A & B - Inlet Manifold Piping
 - c) 2-P60-DWC03-DWCS - Reactor Vessel Filter Trains A & B - Outlet Manifold Piping
 - d) 2-P60-DWC04-DWCS - Transfer Canal/Fuel Pool Filter Trains A & B - Inlet Manifold Piping
 - e) 2-P60-DWC05-DWCS - Reactor Vessel Filter Train Sample Lines
 - f) 2-P60-DWC06-DWCS - Discharge Piping from Sample Boxes No. 1 & No. 2 to Penetration R-537
 - g) 2-P60-DWC07-DWCS - Samples Lines Upstream & Downstream of Ion Exchangers
 - h) 2-P60-DWC08-DWCS - Forwarding Pumps P-6 and P-7, Suction & Discharge Piping
 - i) 2-P60-DWC09-DWCS - Forwarding Pumps P-6 and P-7 Discharge Piping
 - j) 2-P60-DWC10-DWCS - Supply Piping to Ion Exchangers K-1 & K-2, Supply & Discharge Piping from Post Filter F-8
 - k) 2-P60-DWC11-DWCS - Supply Piping to Ion Exchangers K-1, K-2, and K-3
 - l) 2-P60-DWC12-DWCS - Borated Water Flush Piping from SPC-T-4

- m) 2-P60-DWC13-DWCS - Transfer Canal/Fuel Pool Filter Trains "A" & "B" Outlet Manifold Piping
 - n) 2-P60-DWC14-DWCS - Transfer Canal/Fuel Pool Filter Trains "A" & "B" Outlet Manifold Discharge Piping, Supply & Discharge to Booster Pump P-5
 - o) 2-P60-DWC15-DWCS - Nitrogen Supply Piping to SPC-T-4 and Drying Station
 - p) 2-P60-DWC16-DWCS - Discharge Piping from DWC Booster Pump P-5
 - q) 2-P60-DWC17 DWC Miscellaneous Piping Details
 - r) 2-P60-DWC18 - DWCS - Miscellaneous Piping Details
 - s) 2-P60-DWC19 - DWCS - Sample Panel No. 1, FHB
 - t) 2-P60-DWC20 - DWCS - Sample Box No. 2, FHB
 - u) 2-P60-DWC21 - DWCS - Sample Panel No. 2 Drain & Return to Spent Fuel Pool A.
- 19. ECA No. 3245-84-0034 - Defueling Water Cleanup System Penetration Modifications
 - 20. ECA No. 3525-84-0041 - Definition of the Defueling Water Cleanup System (DWCS)
 - 21. ECA No. 3527-84-0042 - SDS Tie-in to DWCS
 - 22. Bechtel Area Piping Drawings
 - a. 2-P70-DWC02 - Instrument Air Manifolds & Hose Routings for DWCS - Reactor & FHB
 - b. 2-P70-DWC03 DWCS Hose Network Reactor Bldg. Plan El. 347'-6"
 - c. 2-P70-DWC04 DWCS Hose Network Fuel Handling Bldg. Plan El. 347'-6"
 - d. 2-P70-DWC05 - DWC System Hose Network Sections and Details
 - e. 2-P70-DWC06 - DWCS - Process Hose Schedule - Reactor & FHB
 - f. 2-P70-CLD01 - Canister Loading & Decontamination System, Fuel Handling Building
 - 23. TER-15737-2-G03-106, TMI-2 Division Technical Evaluation Report for Defueling Water Cleanup System
 - 24. TER-15737-2-G03-114, TMI-2 Division Technical Evaluation Report for Defueling Canisters

1.3 Detailed System Description

1.3.1 Description

The fuel transfer canal/spent fuel pool cleanup system is a liquid processing system which can process water from the spent fuel pool and/or the fuel transfer canal. For the corresponding P&ID's see references 4, 5, and 6. Some valves identified herein have been given an instrumentation designator as well as a valve number. When this occurs, the instrument designator is shown in parentheses after the valve number.

The Spent Fuel Pool (SFP) and the deep end of the Fuel Transfer Canal (FTC) will be filled with water to a level of 327'-3" + 8. A dam with top elevation 328'-2" separates the shallow and deep ends of the FTC.

Two vertical submersible well pumps, P-3A/B, are located in the FTC. Each is capable of pumping a net 200 gpm. A 20 gpm continuous recycle protects the pump motor. P-3A/B take suction from trough-type skimmer U-7 via a 6 inch flexible hose. A secondary, 4 inch, subsurface inlet below the skimmer will prevent pump starvation due to skimmer congestion.

Pumps P-3A/B discharge to the FTC/SFP filter canisters via Reactor Building penetration R-524. The internals of check valve SF-V190 are removed to make use of existing piping connected to R-524.

Two vertical submersible well pumps, P-4A/B, identical to P-3 A/B in the FTC, are located in the SFP. P-4A/B take suction from trough-type skimmer, U-8, similar to U-7.

The system has four particulate filters, each capable of filtering a flow of 100 gpm. The filters are contained in modified fuel canisters submersed in the SFP to provide the appropriate radiation shielding. These filters are capable of removing debris, mainly fuel fines (UO_2) and core debris (ZrO_2), down to a 0.5 micron rating. Since the canisters contain fuel fines, they are designed to prevent a criticality condition from existing when they have been loaded.

The four pumps and four filters are normally manifolded so one pump from each source discharges to one pair of filters. Therefore, the filtration portion of the system is divided into two trains. Train A contains pumps P-3A and P-4A and filter canisters F-9 and F-10. Train B contains pumps P-3B and P-4B and filter canisters F-11 and F-12. In the normal mode the system filters 400 gpm from the FTC and returns the filtrate to the SFP. The system can be manifolded to filter 200 gpm from the FTC and 200 gpm from the SFP or 400 gpm from either source. This

pump arrangement provides both flexibility in operations and the redundancy to permit continued operation during pump maintenance.

The system may also be configured to bypass a set of filter canisters and to route water directly to the post filter and ion exchanger. This may be done by disconnecting the inlet and outlet hoses to one canister, from the manifold, inserting a hose bypass piece between the inlet and outlet flanges on the manifold for that canister position, and closing the isolation valves for the other canister in that train.

A filter canister is used until the differential pressure reaches a set point (See section 2.2). At this point the system is shutdown and then, after a waiting period of approximately 5 minutes, it is restarted. The differential pressure is noted and if it returns to a low value the system will be run again to the pressure setpoint. This process is repeated until the differential pressure at restart reaches a value near the shutdown setpoint. When this occurs within one hour of restart, the train is shutdown and the filters are replaced.

Loaded canisters are expected to generate small quantities of oxygen and hydrogen gas due to radiolysis of water. Pressure relief valves R-8, R-9, R-10 and R-11 are provided on the filter canister outlet lines upstream of their isolation valves. Their purpose is to prevent overpressuring the filter canisters when isolated due to the small quantities of H_2 and O_2 produced (approximately $0.029 \text{ ft}^3/\text{day}$).

Filter canisters are not reusable. The filter canisters are connected to inlet and outlet manifolds via 2-1/2 inch flexible hoses with cam and groove couplings.

Once the water has been filtered, all, or a portion of the flow can be returned to its source (either the SFP or the FTC). The amount of water pumped from its source is controlled by manually adjusting globe valves V097 A/B. The return path to the FTC uses Reactor Building penetration R-539. At each source the return path splits into two 2-inch returns to provide back pressure to valves V097 A/B. One two inch return is used for 200 gpm operation; both are used for 400 gpm operation.

A portion of the flow not returned directly to source can be further processed through either the DWC ion exchanger K-2 or the submerged demineralizer system (SDS). Routing to the SDS is provided as a backup to K-2 and to augment total processing capability during times of high cesium concentration in either source. The DWC ion exchanger K-2 can process 30 gpm. The ion exchange media is a bed of zeolite resin which will remove Cs-137. The resin is

contained in a 4 x 4 liner, similar to those used in EPICOR II. K-2 influent is regulated by flow control valve V085 (FV-15) while K-2 effluent is regulated by level control valve V070 (LV-46). If either high or low levels occur in K-2, LSH-40 or LSL-40 will trip both isolation valve V069, halting influent, and solenoid valve V156, shutting off air supply to DWC forwarding pump P-7, thus halting effluent.

Two post filters are provided. Filter canister post filter F-8 protects K-2 from suspended solids in the event of a canister filter media rupture. DWC post filter F-7 is located downstream of the forwarding pump to prevent the migration of resin fines. DWC forwarding pump P-7, an air driven reciprocating diaphragm pump, provides the head to return flow to either source.

The SDS can process 15 gpm. The DWC Booster Pump, P-5, is provided to increase the pressure to 140 psig to overcome the high SDS differential pressure. P-5 suction pressure will vary inversely with pressure differential across the filter canisters. When the filter canisters are clean or bypassed, P-5 will experience maximum suction pressure. Since P-5 outlet pressure is controlled, pump flowrate varies. Pressure regulator V122 (PCV-26) controls SDS inlet pressure at 140 psig, bypassing excess flow past SDS. PSV R-1 is provided downstream of the DWC Booster Pump to prevent overpressuring the SDS due to V122 (PCV-26) failure. From the SDS, flow is routed to either the FTC or SFP.

In the event of high Sb-125 levels, the return flow from K-2 can be routed to the reactor coolant bleed tanks for batch processing through EPICOR II.

Sample points are provided upstream and downstream of each filter train. These samples are routed to sample box 1, a glove box located in the FHB. The glove box has a self contained blower and HEPA filter which discharge to the FHB ventilation system. Sample points are also provided upstream and downstream of ion exchanger K-2. These samples are routed to sample box 2, a laboratory hood located in the FHB. The hood is connected to combination blower/prefilter, HEPA filter package S-2 and discharges to the FHB atmosphere. The S-2 inlet dampers should be adjusted to maintain a 100 to 140 feet/minute face velocity at the sample box 2 hood.

1.3.2

System Components

F-7/8 Filter Canister Post Filter and DWCS Post Filter

Type: Disposable Cartridge
Model: Filterite No. 921273 Type
18M503C-304-2-FADB-C150

Rating: 0.45 micron nominal removal rating
Flow: 20 to 30 gpm

F-9, F-10, F-11, F-12 Fuel Transfer Canal/Spent Fuel Pool
Filters

Type: Pleated sintered metal media
Model: Pall Trinity special product contained in a
criticality safe canister
Rating: 0.5 micron Nominal Removal Rating
Flow: 100 gpm

K-2 Ion Exchanger

Type: Zeolite resin contained in a 4' x 4' HIC
Model: Nuclear Packaging 50 ft³, Enviroalloy,
Demineralizer/HIC
Flow: 30 gpm

P-3 A/B Fuel Transfer Canal Pumps

Type: Vertical, 2 stage, submersible pump; Goulds
model VIS, size 9AHC, 5.56 in impeller
Metalurgy: Stainless steel bowl, bronze impeller,
416SS shaft
Motor: Franklin Electric 25 HP, 3550 rpm, 460V, 3 phase
Rating: 220 gpm at 264 ft
Shutoff head: 289 ft.
Min Flow: 20 gpm (recirculation)

P-4A/B Spent Fuel Pool Pumps

Identical to P-3A/B

P-5 DWC Booster Pump

Type: Regenerative turbine, 2 stage, SIHI model AEHY
3102 BN 112.42.4
Metalurgy: 316SS casing with 316SS shaft, impeller,
and internals
Motor: 5 HP, 1750 rpm
Rating: 15 gpm at 250 ft
Shutoff head: 390 ft (at min flow)
Min Flow: 5 gpm
Seals: Mechanical, John Crane type 1 with tungsten
carbide seal faces

P-7 Forwarding Pump

Type: Air driven double diaphragm pump
Model: B.A. Bromley Heavy Metal Pump Model No. H25
Material: Stainless Steel with Viton diaphragms
Rating: 60 feet TDH at 60 gpm

PCV-26 Pressure regulator, SDS bypass

Capacity: 25 gpm

Model: Fischer Controls No. 98H

PSV R-1 Relief Valve

Model: Anderson Greenwood No. 81PS88-8

Capacity: 30 gpm

Orifice: Size E, 0.196 in²

Set Pressure: 150 psig

PSV R-8, R-9, R-10, R-11 Relief Valves

Model: Anderson Greenwood No. 83MS46-4L

Orifice: Area: 0.049 in²

Set Pressure: 130 psig

Sample Box 1

Type: Glove Box

Mfgr: Labconco

Model: No. 50002, Radioisotope Glove Box

Material: Fiberglass-reinforced polyester

Built-in Blower: 115 volt, 1/15 HP, variable speed

Filters: Prefilter, HEPA filter

Dimensions: 50" x 30" x 37"

Sample Box 2

Type: Laboratory Hood

Mfgr: Labconco

Model: No. 47810, Radioisotope-47 Laboratory Hood

Material: 316SS

Dimensions: 47" x 29" x 59"

Recommended Face Velocity: 100-140 ft/min

S-2 Sample Box 2 Filtration Module

Mfgr: General Dynamics, Reactor Plant Services

Model: PFB(H)-1000

Filters: Prefilter and HEPA Filter

Blower: 230 VAC, 5 HP, 20 AMP, 3450 rpm

Rated Capacity: 1000 CFM

For further information on valves and instrumentation, refer to the Valve List (Ref. 15) and the Instrument Index (Ref. 14). For a listing of all equipment see the Mechanical Equipment List (Ref. 16). For piping information see the Standard for Piping Line Specifications (Ref. 17).

1.4 System Performance Characteristics

The system is designed to function in any of the modes of operation shown in Table 1 below.

Table 1

Fuel Transfer Canal/Spent Fuel Pool Cleanup System Operational Configurations

<u>Filter Flow (GPM)</u>		<u>SDS Flow (GPM)</u>		<u>K-2 Flow (GPM)</u>	
<u>From FTC</u>	<u>From SFP</u>	<u>From FTC</u>	<u>From SFP</u>	<u>From FTC</u>	<u>From SFP</u>
400 [200]	0	0	0	0	0
400 [200]	0	15	0	0	0
400 [200]	0	0	0	30	0
400 [200]	0	15	0	30	0
0	400 [200]	0	0	0	0
0	400 [200]	0	15	0	0
0	400 [200]	0	0	0	30
0	400 [200]	0	15	0	30
200	200	0	0	0	0
200	200	15	0	0	0
200	200	0	15	0	0
200	200	0	0	30	0
200	200	0	0	0	30
200	200	15	0	0	30
200	200	0	15	30	0
0	0	15	0	0	0
0	0	0	15	0	0
0	0	0	0	30	0
0	0	0	0	0	30
0	0	15	0	30	0
0	0	0	15	0	30

(numbers in brackets indicate 1 pump operation)

The operational mode is determined based upon which source needs to be processed. Normally, 30 gpm from the FTC will be processed through the ion exchanger and returned to the SFP (no filtration). During periods of high Cs-137 loading, an additional 15 gpm could be processed through the SDS, which would reduce the recovery time of the source. If the visibility in either source becomes too poor for defueling operations or exceeds an NTU value of 5, processing should be discontinued until visibility is restored and the NTU valve is below 5. This would be done by filtering from the proper source, through the train without the bypass hose piece.

1.5 System Arrangement

References 7 and 8 present the positioning of equipment. Well pumps P-3 A/B, are submersed in 10 inch diameter wells in the north end of the fuel transfer canal in the Reactor Building. The wells are connected by a 6" flexible hose to skimmer U-7 located at the dam separating the deep and shallow ends of the fuel transfer canal. Well pumps P-4A/B are submersed in the northeast end of spent fuel pool "A" in the Fuel Handling Building. These wells are connected by a 6" flexible hose to skimmer U-8 located at the south end of the SFP.

The discharge of pumps P-3A/B and P-4A/B is routed to the filter canisters inlet manifold near the northeast end of the SFP. The filter isolation valves, vent valves, and manual control valves V090A/B (HV-64A/B) are also located there. The filter outlet manifold is adjacent to the inlet manifold.

Filter canisters F-9, F-10, F-11, and F-12 are submersed in the SFP in the north end of the dense pack fuel rack. They are connected to the inlet and outlet manifolds by 2-1/2 inch steel guarded, flexible, coded hoses equipped with cam and groove couplings. The coupling at the fuel canister is modified for long handled tool operation.

From the filter outlet manifold the water is routed either directly back to source or to the DWC ion exchanger K-2 or SDS for further processing. The DWC ion exchangers are located behind appropriate shielding in the northwest end of the Fuel Handling Building. The forwarding pump P-7 is located near K-2.

Sample box 1 is located at the southeast end of the spent fuel pool A and sample box 2 is on the DWCS platform near the DWC ion exchangers.

The system uses the following existing penetrations which have been modified for their temporary function. Armored hose is used downstream of penetration R-539 to the FTC.

<u>Penetration No.</u>	<u>System</u>	<u>Modified Function</u>
R-524	Spent Fuel Cooling	Discharge from Fuel Transfer Canal Pumps
R-539	Decay Heat Closed Cooling Water	Return to Fuel Transfer Canal

1.6 Instrumentation and Control

1.6.1 Controls

The components of this system are located in accessible areas of the Fuel Handling Building and the Reactor Building. With the exception of the DWC ion exchanger loop, valve alignment and adjustment is performed manually to achieve the proper flows to and from the various sources.

The flow to DWC ion exchanger K-2 is regulated automatically by flow control valve V085 (FV-15). K-2 effluent is regulated automatically by level control valve V070 (LV-46).

1.6.2 Power

The pump motors are supplied with 480V power through a motor control center which is energized by an existing unit substation located in the Auxiliary Building. A stepdown transformer will provide 120 VAC for valve operation and the control panel.

1.6.3 Monitoring

Monitoring equipment is provided to evaluate the performance of the system and to aid in proper operation of the system.

PI-25 monitors the Booster Pump discharge pressure to verify the correct operation of both the pump and the bypass pressure regulator, V122 (PCV-26)

FI-15 and FQI-15 monitor the flowrate and total flow of filtered water routed to DWC ion exchanger K-2

AE-16 monitors the pH in the water leaving K-2 and SDS to verify this parameter was not altered during ion exchange

FI-23A and FQI-23A monitor the flowrate and total flow of filtered water returned directly to the FTC

FI-23B and FQI-23B monitor the flowrate and total flow of filtered water returned directly to the SFP

FI-60 & FQI-60 monitor flowrate and total flow to the SDS to measure system performance and to record water processed

DPI-22A/B monitor the differential pressure across the filter canisters to determine degree of loading and therefore time of replacement

LI-46 monitors the liquid level in DWC ion exchanger K-2

FCC-LI-102 and SF-LI-102 monitor the water level in the Fuel Transfer Canal and Spent Fuel Pool. They are panel mounted in the control room. The level indication system is a bubbler type system. A high or low level in the FTC will alarm FCC-LAHL-102 and a high or low level in the SFP will alarm SF-LAHL-102 at the panel in the control room. Additionally, there is a joint FTC/SFP high-low level alarm (FCC-LAHL-103) that is locally mounted and alarms on a high or low level in the FTC or SFP.

PI-81 and PI-82 monitor the pressure in the two instrument air manifolds in the Fuel Handling Building.

The process fluid conditions can be sampled to determine the effectiveness of the system. The capability to obtain grab samples of process fluid has been provided at the inlet and outlet piping of the Fuel Transfer Canal/Spent Fuel Pool Filter Trains A and B. Grab samples may also be taken on the inlet/outlet lines to the DWC ion exchangers as well as several points in the SDS.

In line flow indicators are provided in the return lines from the Sample Boxes to Spent Fuel Pool A. Their purpose is to confirm that flow exists through the sample box piping, and therefore, provide a means of assuring that a representative sample has been taken by showing that there has been flow long enough to flush out the stagnant water.

1.6.4 Trips

Low or high liquid levels in DWC ion exchanger K-2 will terminate flow to and from K-2. Both LSL-40 and LSH-40 trip closed the inlet isolation valve V069 and P-7 air supply isolation valve V156.

A locally mounted switch is provided at K-2 to override the level trips to fill and drain the ion exchanger. A signal alarm at the DWC control panel will notify the operator that the override is engaged.

1.7 System Interfaces

Those systems interfacing with the DWC are as follows:

- a) Standby Reactor Pressure Control System (existing)
 Use: Provide a source of borated water for backflushing
 Tie-in: A single connection from SPC-T-4 downstream of SPC-V1 to the inlet manifold piping for the Fuel Transfer Canal/Spent Fuel Pool Filters, Trains A and B
- b) Submerged Demineralizer System (existing)
 Use: Provide a system for soluble fission product processing.
 Tie-in: To downstream of pump WG-P-1 of SDS from downstream of Fuel Transfer Canal/Spent Fuel Pool Filters. From downstream of the SDS polishing filter to downstream of the DWCS manual control valves V097A/B.
- c) Instrument Air System (existing)
 Use: Provide source of instrument air to equipment.
 Tie-in: At existing valves AH-V220 and IA-V171
- d) Service Air System (existing)
 Use: Provide a source of service air to the forwarding pump P-7.
 Tie-in: Service Station 87 plus another station if needed

- e) Dewatering System
Use: Allow periodic use of DWC ion exchanger K-2 for the Dewatering System.
Tie-in: Upstream of filter canister post filter F-8.
- f) Canister Loading & Decontamination System (new)
Use: Provide borated water for surface decontamination of canisters.
Tie-in: At Valves DWC-V321, V322, & V323.

1.8 QUALITY ASSURANCE

The defueling water cleanup system is classified according to the safety functions of its parts. There are three classifications in this system:

- a. Portions of the system associated with ion exchange processing are considered to be a radioactive waste processing system; therefore, these portions of the system shall be subject to the quality assurance guidelines contained in NRC Regulatory Guide 1.143.
- b. The filter canisters are classified as nuclear safety related and are designed to prevent a condition that could result in a return to nuclear criticality of the fuel retained in the filters.
- c. The remaining portions of the system are subject to the BNAPC non-safety-related quality assurance program.

The TMI-2 Recovery QA Plan will be applicable for work performed on site.

2.0 System Limitations, Setpoints, and Precautions

2.1 Limitations

The system is flow limited to 200 gpm through each filter train, 15 gpm through SDS and 30 gpm through the DWC ion exchanger K-2.

The main filter canisters are limited to 55 psid as read on DPI-22A/B. This allows a 45 psi differential across the filter media, with 10 psi of drop due to friction losses in the piping and hoses at design flow.

At this point an alarm on a local panel will inform the operator of the need to stop and restart the system or to remove and replace the filter.

The filter canister post filter (F-8) is limited to 18 psid. The ion exchanger post filter (F-7) is limited to 45 psid. Filters are considered full and ready for change out when either the maximum pressure differential is reached or when the performance (flow) drops 20% below the design flow.

| 5

The system should not be started and stopped frequently since the canister filter precoat is lost during a shutdown; thus it will be necessary to reestablish a precoat on starting up before processing through SDS or K-2.

2.2 Setpoints

DPSH-22A or DPSH-22B Trips alarm at 55 psi pressure differential across either FTC/SFP filter train A or B.

LSL-40 & LSH-40 Trip alarm, trip closed inlet isolation valve V069 and trip closed P-7 air supply valve V156, shutting down P-7. Low level set point is 10 inches below top of ion exchanger. High level set point is 4 inches below top of ion exchanger (i.e., ± 3 " from normal liquid level).

PSV-R-1 Set to relieve at 150 psig with 10% overpressure to protect SDS.

PSV-R-8, R-9, R-10, & R-11 Set to relieve at 130 psig with 10% overpressure to protect the filter canisters from hydrogen/oxygen build up.

PCV-26 Regulates upstream pressure (SDS inlet pressure) at 140 psig.

Level indicators FCC-LI-102 and SF-LI-102 for Fuel Transfer Canal and Spent Fuel Pool "A" levels, respectively, are located on control panel SPC-PNL-3 on the main control panel. In addition, high-low alarms FCC-LAHL-102 and SF-LAHL-102 are provided on SPC-PNL-3 for the FTC and SFP. High level setpoint is 327'-11" and low level set point is 327'-1".

Level indication switches SF-LIS-103 and FCC-LIS-103 actuate a common alarm FCC-LAHL-103 located on panel DWC-LCP1 on high or low levels in the SFP or FTC. High level set point is 328'-1" and low level set point is 326'-11".

2.3 Precautions

Due to the use of quick disconnect couplings, extra care should be taken to ensure that the couplings are properly connected and that they are connected in the proper locations.

The filter canisters operate by a surface filtration method, and their efficiency increases as a cake is built up on the surface of the media. Therefore, the build up of this cake is an important part of the filtration process. To prevent the migration of fines to the post filter, the ion exchange portion of the system should not be started until a cake has begun to be formed on the media. This can be verified by observing the turbidity of the filter effluent. When the filter train is started up, there will be an initial turbidity spike caused by smaller particles passing through the media. As the cake is built, these particles are stopped and

the turbidity decreases. Once the turbidity reaches a level of 5 NTU or less, the ion exchange portion of the system can be started. Also, to prevent the breakdown of the cake, the system should not be started or stopped unnecessarily. | 5

Caution should be taken during a change of pump feeding a filter train. The new pump should be started and put on line before shutting down the existing pump to protect the filter cake. Note that outside of this brief exception no more than one pump should feed one filter train.

The portion of the startup procedures concerning the well pumps should be strictly adhered in order to prevent the rapid filling of an empty manifold. This situation could cause a harmful pressure wave to develop which might damage the canister filter media.

The Reactor Building penetrations R-524 at elevation 293 ft-6 in and R-539 at elevation 320 ft are both below the water level of 327'-3" +8 -2. When in use the connecting piping/hose should be periodically checked since a line break will cause water to be lost from the system. When not in use, the hose should be isolated by closing valves V117A/B and V-099 (see discussion in section 4.5). | 5

Periodically the face velocity across the sample box 2 hood should be checked to verify it is within the range of 100 to 140 feet/min. If the face velocity is too low the S-2 inlet dampers should be readjusted accordingly.

3.0 OPERATIONS

3.1 Initial Fill

To initially fill the SFP & FTC borated water from the Spent Fuel Cooling System may be pumped from the borated water storage tank, DH-T-1, by the spent fuel cooling pumps, SF-P-1A/B. To fill the FTC the water may be routed through penetration R-524 and into the FTC through the 3 inch fill line downstream of the P-3A discharge check valve. To fill the SFP, V087A/B and V097B are opened and the borated water may be routed through the filter canisters and through the normal return process path to the SFP.

The system is filled initially by borated water from the standby reactor coolant pressure system through the backflushing system provided (see section 3.7). The filters are filled to the inlet and outlet manifolds.

To initially fill the DWC ion exchanger K-2, the level switch LSL-40 must be overridden (see section 1.6.4) until low level is attained. At this time the override switch should be returned to normal operation for further filling.

3.2 Startup

Prior to starting the system, the suction valve alignment is verified for the mode of operation selected. The valves to the ion exchange portions of the system are also verified to be closed. The pump discharge isolation valves are closed and the cross-tie valves are closed. The pump for one train is started and allowed to operate on minimum recirculation flow. The isolation valve for this pump is slowly opened. Then the hand control valve V090 A or B (HV-64 A or B) is opened 10% and any trapped air vented through manual vent valves located on the inlet and outlet manifolds. After venting, V090 (HV-64) is opened fully. Once this has been accomplished, the appropriate outlet cross-tie valve(s) (V096 A/B and V095) are opened. Flow is started by slowly opening the appropriate hand operated control valve (V097 A or B) until the desired flow is obtained. Note that V097 A/B are provided for flow control of the system. Once one train has been started, the other train, if desired, may be brought into service in the same manner.

Filter performance will initially increase with time as a cake forms on the filter surface. Therefore, the filtered water should be returned directly to source without further processing until this cake forms, as evidenced by a decrease in turbidity. A turbidity below 5 NTU is sufficient to route to K-2 or SDS. | 5

The DWC ion exchanger K-2 should always be brought to normal operating liquid level prior to operation of this portion of the system. Either borated flush water or filtered water of less than 5 NTU can be used. If the liquid level is below the low level trip, the level switch trip override must be engaged until low level is established (see section 3.1). Once normal level is established, the air supply solenoid valve V156 is opened. Pressure regulator V157 (PICV-58) is then manually adjusted to the pressure required to maintain the desired flowrate. Flow is slowly started to K-2 by opening flow control valve V085 (FV-15) until the desired flowrate to K-2 is obtained. K-2 effluent is automatically controlled by level control valve V070 (LV-46). | 5

Processing water through the SDS requires opening the isolation valves for that portion of the system and starting the DWC Booster pump. These actions will allow 15 gpm to be processed through the SDS. For a detailed description of the SDS see reference 12.

The sample box 2 filtration module inlet dampers should be adjusted to create a 140 feet per minute face velocity across sample box 2.

3.3 Normal Operation

Normal operation of the system is in one of the modes shown in Table 1 of Section 1.4. The mode of operation is chosen based on what source is to be processed and what the particulate and radioactivity concentrations of the sources are.

3.4 Shutdown

The steps to bring the system to a shutdown condition are basically the reverse of the startup procedure. The ion exchanger flow is brought to zero gradually by remote operation of upstream control valve V085 (FV-15). Correspondingly, level control valve V070 (LV-46) will gradually terminate flow from K-2. After termination of flow the inlet isolation valve V069 is closed and the P-7 air supply isolation valve is closed. If the SDS is in use, the booster pump is switched off and isolation valves V111, V139, and V102 are closed. Following this, the well pumps are switched off and the pump isolation valves and the cross-tie valves are closed.

3.5 Draining

The majority of the system can be drained to the spent fuel pool. The filter canisters can not be drained, since they are submerged in the SFP. The piping to/from penetrations R-524 and R-539 must be drained to the Auxiliary Building sump since the penetration elevation is below the spent fuel pool water level. The DWC ion exchanger K-2 can be pumped out to either source, FTC or SFP, or to the reactor coolant bleed tanks via a portion of the SDS. A switch is provided to override the low level switch for pumping out K-2.

3.6 Refilling

The fully drained system may be refilled in the same manner that the system was initially filled. A partially drained system may be refilled by using either the back flush system (see section 3.7) or the well pumps (see section 3.2).

3.7 Infrequent Operations

Flushing of the system may be performed when the internal contamination level gets high or prior to internal maintenance work. The system is shutdown (see Section 3.4) prior to flushing.

One flushing option is gravity flush from SPC-T-4. Borated water is stored in the charging water storage tank, SPC-T-4, located at the 347 ft. elevation in the Fuel Handling Building. This tank is connected to the DWCS. If desired, the CLD booster pump (CLD-P-1) may be used to assist in backflushing. Either filter train may be flushed without stopping flow through the other.

Flushing may be accomplished by opening one of the inlet valves from the flushing system (depending on which portion of the system is to be flushed) and then routing the flow to the fuel transfer canal or the spent fuel pool. After sufficient time has been allowed to flush the system, the inlet valve from the flushing system is closed, and the system is then restarted following the procedures in Section 3.2.

3.8 Transient Operations

The results of loss of pumps or filter train misalignment are flows not returning to the proper source. However, since this is the normal operational mode of the system and since the sources are connected by the fuel transfer tubes, the results of these transients are negligible. Vent or drain valve misoperation would have the same effect as a line break (see section 4.5) but could be more readily rectified.

4.0 CASUALTY EVENTS AND RECOVERY PROCEDURES

4.1 Loss of Power

A loss of power to any portion of the system would shut that portion of the system down. No adverse conditions would result.

4.2 Loss of Instrumentation/Instrument Air

Loss of instrumentation would hamper operations due to loss of monitoring capability but no adverse conditions would result and the system could be safely shut down until the problem is resolved.

Loss of a single instrument channel will result in the loss of indication for that channel and, for those channels that have control features a flow mismatch. This flow mismatch will result in an automatic shutdown of the affected portion of the system.

Loss of either the spent fuel pool or FTC level monitoring system will be noted when compared with the other. The readings should normally be the same since both water bodies are in communication via the fuel transfer tubes. Neither system has control features.

Loss of instrument air will take the individual components to their fail safe position. Flow mismatches induced by loss of air will result in automatic trips.

On loss of instrument air, level control to the ion exchanger would be lost. But both the inlet isolation valve V069 and the outlet level control valve V070 (LV-46) would fail closed isolating the ion exchanger.

4.3 Deleted

4.4 Filter Media Rupture

A failure of the filter media in the canister could potentially release fuel fines to the ion exchange portion of the system. The SDS is equipped with a sand prefilter which has borosilicate glass to control reactivity (see ref. 12) and the DWC filter canister post filter precedes DWC ion exchanger K-2. There are differential pressure gauges supplied on the filters to determine if they are loading. Loading of the SDS prefilter or the filter canister post filter could indicate ruptured filter media.

The recovery procedure is to isolate the filter trains and find the ruptured filter by observing the differential pressure versus flow for each individual canister. Lower differential pressure for a given flow will indicate that this filter is ruptured. That canister or canisters and the post filter cartridge and/or SDS sand filter would be replaced and the system restarted.

The system may be operated in a mode that bypasses the filter canisters. During this mode of operation, the filter canister post filter will be providing the required system filtration. In order to preclude the rupture of the post filter's filter media during operation, the maximum differential pressure that will be permitted across the post filter will be 18 psid. The post filters are designed for a maximum differential pressure of 45 psid.

5

4.5 Line and Hose Break

If a rupture occurred in the system, the pumps could deliver fuel transfer canal and/or spent fuel pool water to the Fuel Handling Building or the Reactor Building. This action would lower the level in the canal and the pool. A drop of one inch in canal/pool level is approximately equivalent to 1250 gal. A level loss would be detected and alarmed (see setpoints section 2.2) by at least one of the two redundant level monitors provided for the canal/pool. The operator would then shut the system down.

Process water hoses are employed in three services in this system; filter canister inlet/outlet, skimmers to well pumps, and downstream of penetration R-539.

If a filter canister inlet/outlet hose ruptures, that canister will be isolated and the hose replaced. Since these hoses are submerged in the SFP, this results in no net water loss.

If a hose connecting the skimmer (U-7 or U-8) to the well pumps breaks, then the ability to surface skim will be hampered or lost, but pump capacity will not be diminished nor will there be a loss of water.

If the hose on the FTC return line downstream of penetration R-539 breaks, then process water will be lost to the Reactor Building sump. The resulting loss in level would be detected and alarmed by the canal/pool monitors. This hose is steel armored to minimize accidental damage. Check valves V-235A/B are provided to prevent siphoning the FTC if the hose (or connecting line) breaks.

Furthermore, the normal return path is to the SFP; thus this hose is not normally used. When not in use this hose will be isolated by closing valves V117A/B and V099 to minimize the effect of a hose break.

A break on the P-3A/B discharge line which uses penetration R-524 would cause process water to be lost to either the Reactor Building or the Fuel Handling Building. The water loss would be detected both by a decrease in the monitored flowrate returned to the fuel pool or fuel transfer canal and also by the drop in fuel pool and/or transfer canal level. When the fuel transfer canal pumps, P-3A/B, are not in use, the discharge valves V002A/B and valve SF-V103 should be closed. This would prevent a syphoning of the FTC when the pumps are not in use.

5.0 SYSTEM MAINTENANCE

The maintenance procedures are the recommended practices and intervals as described by the equipment vendors.

6.0 TESTING

6.1 Hydrostatic Testing

All piping and hose will be hydrostatically pressure tested. Testing of hose will be done after couplings have been attached. Pipe will be tested outside the buildings.

6.2 Leak Testing

All accessible connections will be initial service leak tested after the piping is assembled.

6.3 Instrument Testing

All instruments will be calibrated by vendors. Complete electric/pneumatic loop verification will be done during start-up.

7.0 HUMAN FACTORS

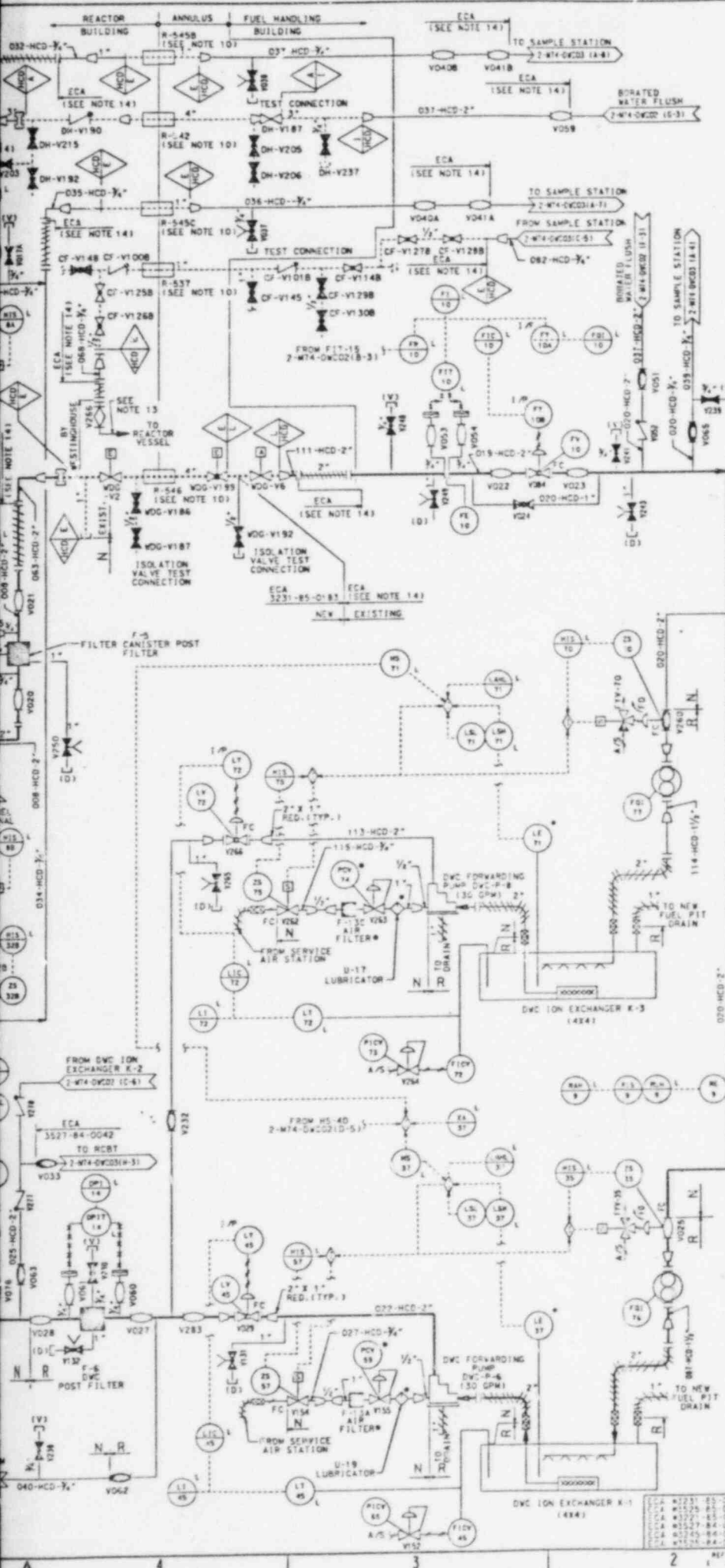
Filter canister hoses are coded for quick identification of inlet versus outlet.

Extensive use of hoses is made, especially in the Reactor Building, allowing quick installation and use of existing radiation shielding. Hoses expected to be frequently disconnected are equipped with quick disconnect couplings for ease of removal and replacement.

The following human factors guidelines have been incorporated into the design of the DWCS control panel:

- o The panel includes all controls and displays required for normal operation.
- o Displays provide immediate feedback that the system has responded appropriately to an operator's action.

- o Controls and displays are laid-out for a left to right flow path.
- o Mimic lines are used to clarify flow paths.
- o Control devices are mounted to 3 to 6 feet above the floor.
- o Each control device has a nameplate.
- o Light bulbs are replaceable from the front of the panel.
- o Recorders are grouped on the right side of the panel away from the flow path.
- o Adjustments to recorders and controllers can be performed from the front of the panel.



NOTES:

- FOR PID LEGEND, SEE DRAWING 2-M74-DWC01.
- Q—INDICATES PORTIONS OF THE SYSTEM (FILTER CANISTERS AND FILTER MEDIA) THAT ARE SUBJECT TO THE SAFETY RELATED QUALITY ASSURANCE PROGRAM.
- N—INDICATES PORTIONS OF THE SYSTEM THAT ARE SUBJECT TO THE NON-SAFETY RELATED QUALITY ASSURANCE PROGRAM.
- R—INDICATES THOSE PORTIONS OF THE SYSTEM SUBJECT TO THE NON-SAFETY RELATED QUALITY ASSURANCE PROGRAM FOR RADWASTE MANAGEMENT SYSTEMS PROGRAM (REG. GUIDE 1.143.1).
- THE SAFETY AND NON-SAFETY RELATED QUALITY ASSURANCE PROGRAMS APPLY TO OFFSITE WORK DONE BY DECHTEL, FOR ONSITE WORK, REQUIREMENTS OF THE TWI-2 RECOVERY QUALITY ASSURANCE PROGRAM SHALL APPLY.
- UNLESS OTHERWISE NOTED, ALL EQUIPMENT, VALVES, INSTRUMENTS AND LINE NUMBERS ARE PREFIXED BY THE SYSTEM DESIGNATOR DWG.
- ALL LOCAL CONTROL PANEL MOUNTED DEVICES, EXCEPT RC LEVEL INSTRUMENTS, ARE LOCATED ON THE CONTROL PANEL DWG-LOPI ON EL. 347'-6" OF THE FUEL HANDLING BUILDING.
- DELETED
- THIS SYSTEM IS TO SUPPORT THE RECOVERY EFFORT AND IS TO BE REMOVED PRIOR TO PLANT RESTART.
- THE FOLLOWING EXISTING REACTOR BUILDING PENETRATIONS ARE USED FOR THIS SYSTEM TO SUPPORT THE RECOVERY EFFORT AND ARE TO BE RESTORED TO THEIR ORIGINAL CONFIGURATION PRIOR TO PLANT RESTART.

PENETRATION NO.	SYSTEM	REF. BMR FLOW DIAG.
R-542	DECAY HEAT	2026
R-546	RADWASTE DISPOSAL GAS	2028
R-555	RADWASTE DISPOSAL REACTOR COOLANT LIQUID	2027
R-537	R.B. EMERGENCY SPRAY AND CORE FLOODING	2034
R-545B	SPARE	
R-545C	SPARE	

- VALVES V040A B B AND V046A B B ARE AUTOMATIC VENT TYPE VALVES. TYPICAL AUTOMATIC VENT VALVE:  (IN.C.)
- THE NUMBER IN PARENTHESIS BY AN INSTRUMENTATION SYMBOL,  INDICATES THE LOCATION OF THE INSTRUMENT AS FOLLOWS:
 (1) BURLER CONTROL PANEL RC-LOPI
 (2) CONTROL PANEL SPC-PNL-3
 (3) SCS CONTROL PANEL CN-PNL-1
 (4) MAIN CONTROL ROOM PANEL 4
 (5) PATCH BOARD CABINET 217
- 4" SUPPLY LINES FROM THE REACTOR VESSEL ARE SUPPLIED WITH TWO 3/4" SIPHON BREAK HOLES LOCATED 18" BELOW THE NORMAL WATER LEVEL.
 2" RETURN LINES TO THE VESSEL ARE EQUIPPED WITH SPARGERS WITH THE TOP HOLES ARE LOCATED 18" BELOW THE NORMAL WATER LEVEL. 3/4" SAMPLE RETURN LINE TERMINATES 18" BELOW THE NORMAL WATER LEVEL.
- THE LETTERS 'ECA' AND THE ACCOMPANYING ARROW INDICATE THE FUNCTIONAL BOUNDARIES OF ECA #0245-84-0034, DEFUELING WATER CLEANUP SYSTEM PENETRATION MODIFICATIONS. UNLESS OTHERWISE NOTED, THE REMAINDER OF THIS DRAWING IS COVERED UNDER ECA #0525-84-0041, DEFINITION OF THE DEFUELING WATER CLEANUP SYSTEM.
- VALVE FAILS CLOSED ON LOSS OF ELECTRICAL SIGNAL. VALVE FAILS OPEN ON LOSS OF PNEUMATIC SUPPLY.

TI
APERTURE
CARD




8602190108-01


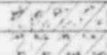















Also Available On
Aperture Card

SEE REVISION NOTICE		REV. NO.	
ISSUED FOR CONSTRUCTION		REV. NO.	
DATE		DATE	
BY		BY	
CHECKED		CHECKED	
APPROVED		APPROVED	
DECHTEL 6A11-DECHTEL, MARYLAND GPU NUCLEAR METROPOLITAN EDISON THREE MILE ISLAND - UNIT 2			
PIPING & INSTRUMENT DIAGRAM DEFUELING WATER CLEANUP (DWC) REACTOR VESSEL CLEANUP SYSTEM			
JOB NO.		DRAWING NO.	
15737		2-M74-DWC01	
REV.		REV.	
1		7	

[illegible]

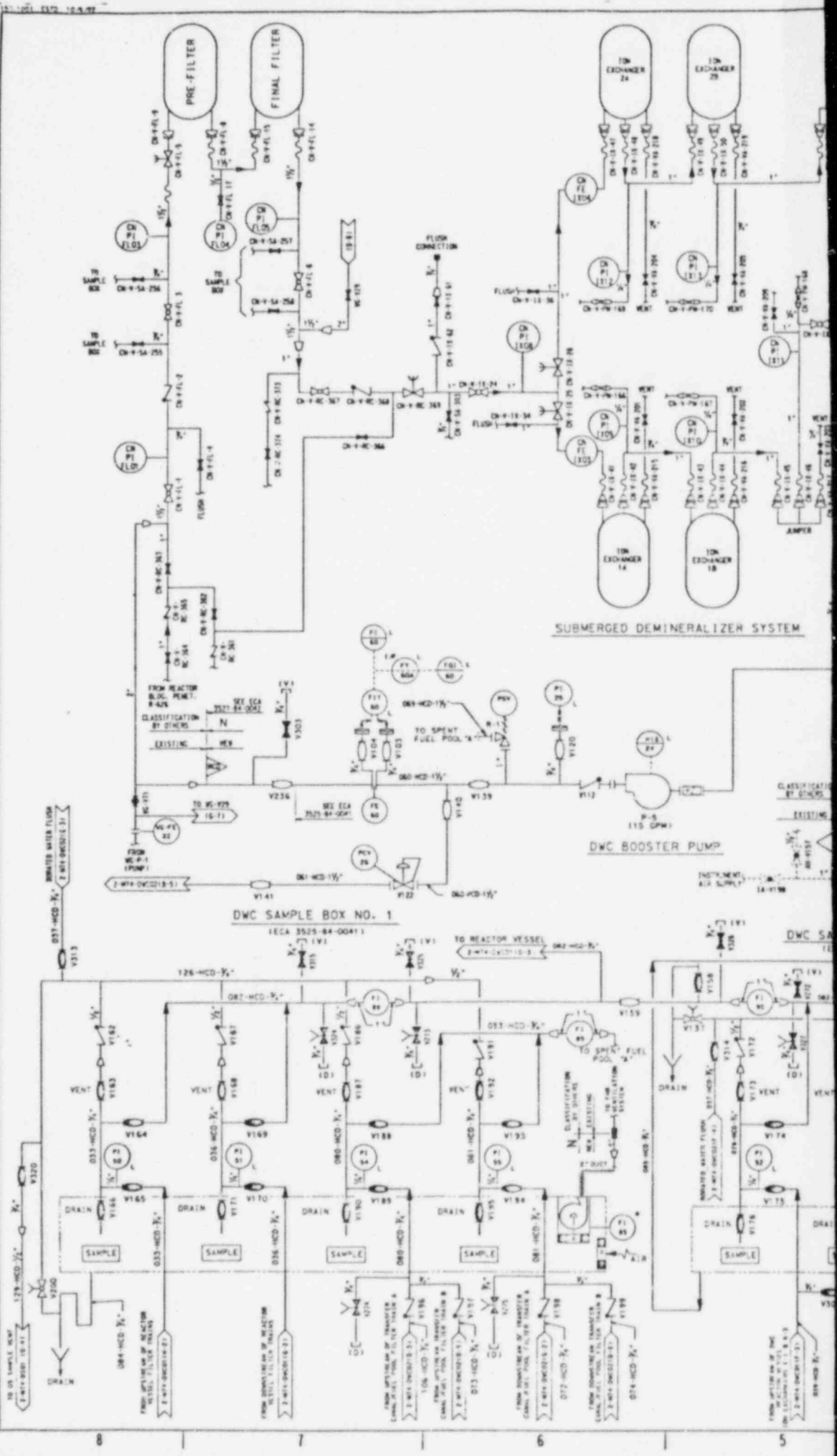


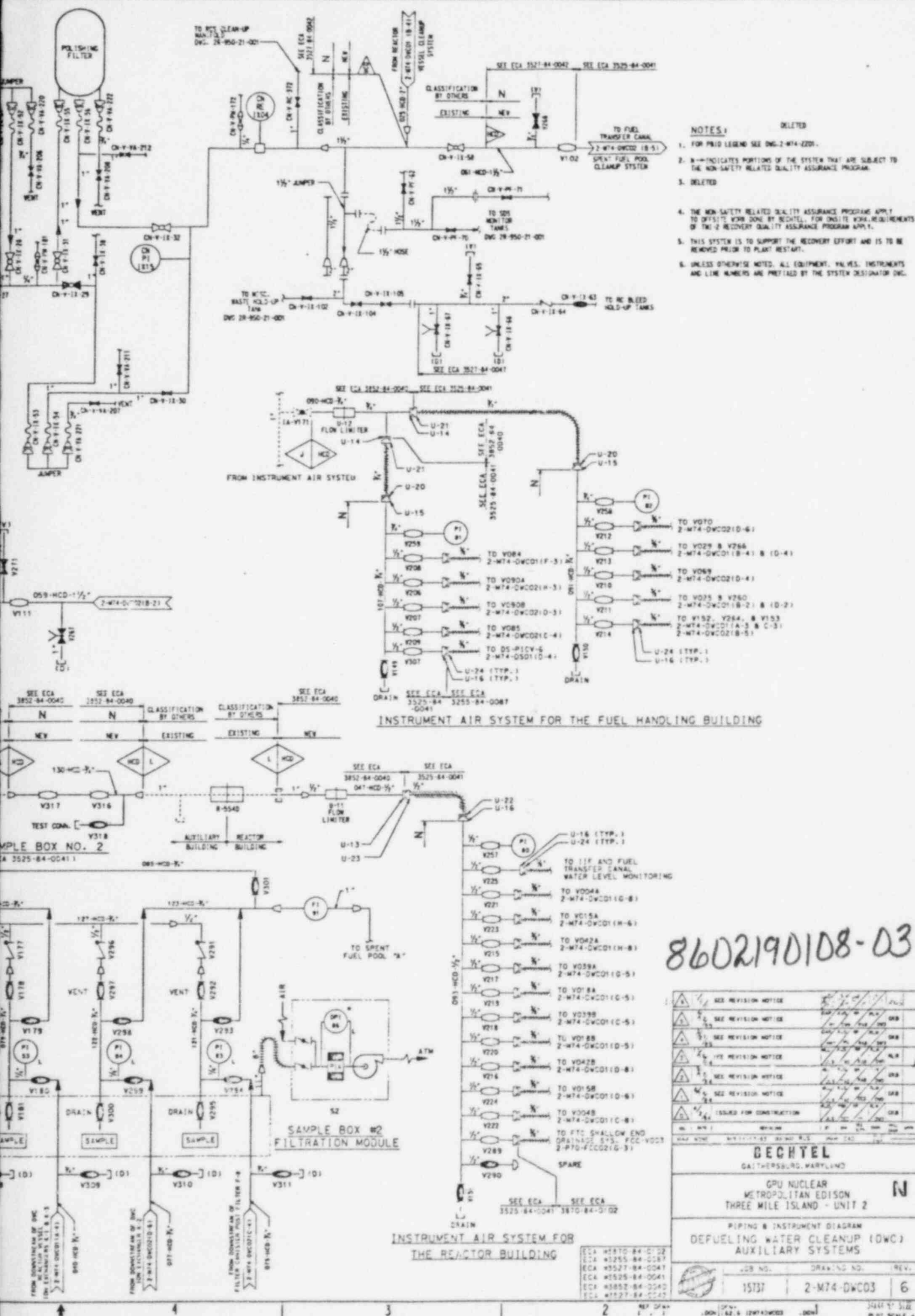
1. FOR P&ID LEGEND, SEE DRAWING 2-M74-2701.
2.  INDICATES PORTIONS OF THE SYSTEM (FILTER CANISTERS AND FILTER MEDIA) THAT ARE SUBJECT TO THE SAFETY RELATED QUALITY ASSURANCE PROGRAM.
3.  INDICATES PORTIONS OF THE SYSTEM THAT ARE SUBJECT TO THE NON-SAFETY RELATED QUALITY ASSURANCE PROGRAM.
4. THE SAFETY AND NON-SAFETY RELATED QUALITY ASSURANCE PROGRAMS APPLY TO OFFSITE WORK DONE BY BECHTEL. FOR ONSITE WORK, REQUIREMENTS OF THE 2 RECOVERY QUALITY ASSURANCE PROGRAM SHALL APPLY.
5. UNLESS OTHERWISE NOTED, ALL EQUIPMENT, VALVES, INSTRUMENT, AND LINE NUMBERS ARE PREFIXED BY THE SYSTEM DESIGNATOR DW.
6. DELETED
7. DELETED
8. ALL LOCAL CONTROL PANEL MOUNTED DEVICES ARE LOCATED ON THE CONTROL PANEL DW-LOPM ON ELEVATION 347'-6" OF THE FUEL HANDLING BUILDING.
9. SPENT FUEL COOLING AND DECAY HEAT REMOVAL SYSTEMS ARE SHOWN FOR THE PURPOSE OF DOUBLE ISOLATION CRITERIA.
10. THIS SYSTEM IS TO SUPPORT THE RECOVERY EFFORT AND IS TO BE REMOVED PRIOR TO PLANT RESTART.
11. THE EXISTING REACTOR BUILDING PENETRATION R-539 (DECAY HEAT CLOSED COOLING WATER BBR 2005) IS USED FOR THIS SYSTEM TO SUPPORT THE RECOVERY EFFORT AND IS TO BE RESTORED TO ITS ORIGINAL CONFIGURATION PRIOR TO PLANT RESTART.
12. DELETED
13.  INDICATES PORTIONS OF THE SYSTEM THAT ARE SUBJECT TO THE NON-SAFETY RELATED QUALITY ASSURANCE PROGRAM FOR RADIATION MANAGEMENT SYSTEMS (REG. GUIDE 1.143).
14. VALVE FAILS CLOSED ON LOSS OF ELECTRICAL SIGNAL. VALVE FAILS OPEN ON LOSS OF PNEUMATIC SUPPLY.
15. LOCATION OF HOSE JUMPER AND VALVE LINE-UP IS TO REPRESENT SYSTEM CONFIGURATION FOR PROCESSING THROUGH ION EXCHANGER WITHOUT USING THE FILTER CANISTERS. LOCATION OF HOSE JUMPER IS TO BE DETERMINED BY FIELD.

	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB
	SEE REVISION NOTICE		QXB

10-10-74-DW-133 REV 6

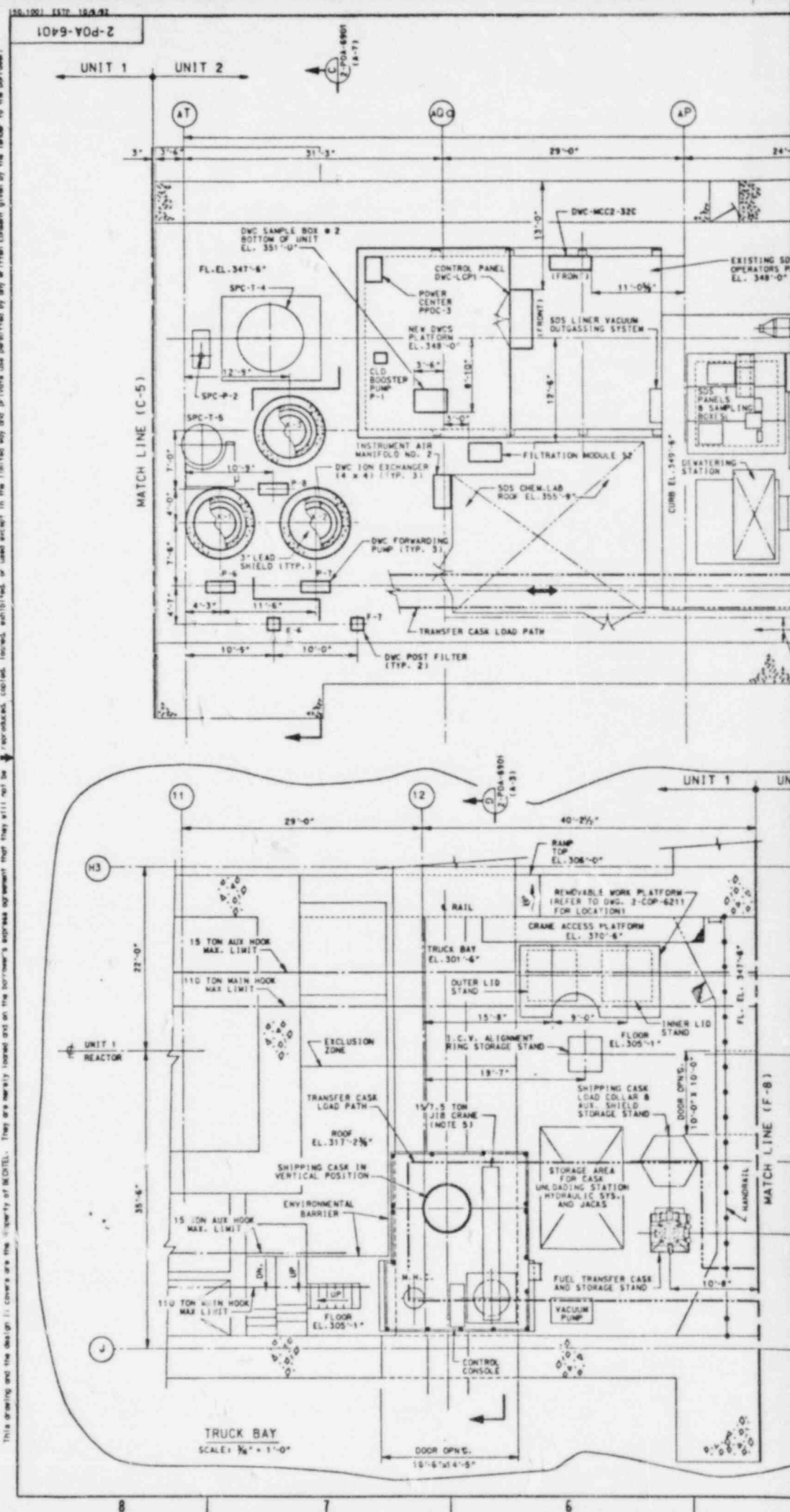
This drawing and the design it covers are the property of BETHLEHEM. They are hereby loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, or used except in the limited way and for the limited purpose given by the loan to the borrower.





8602190108-03

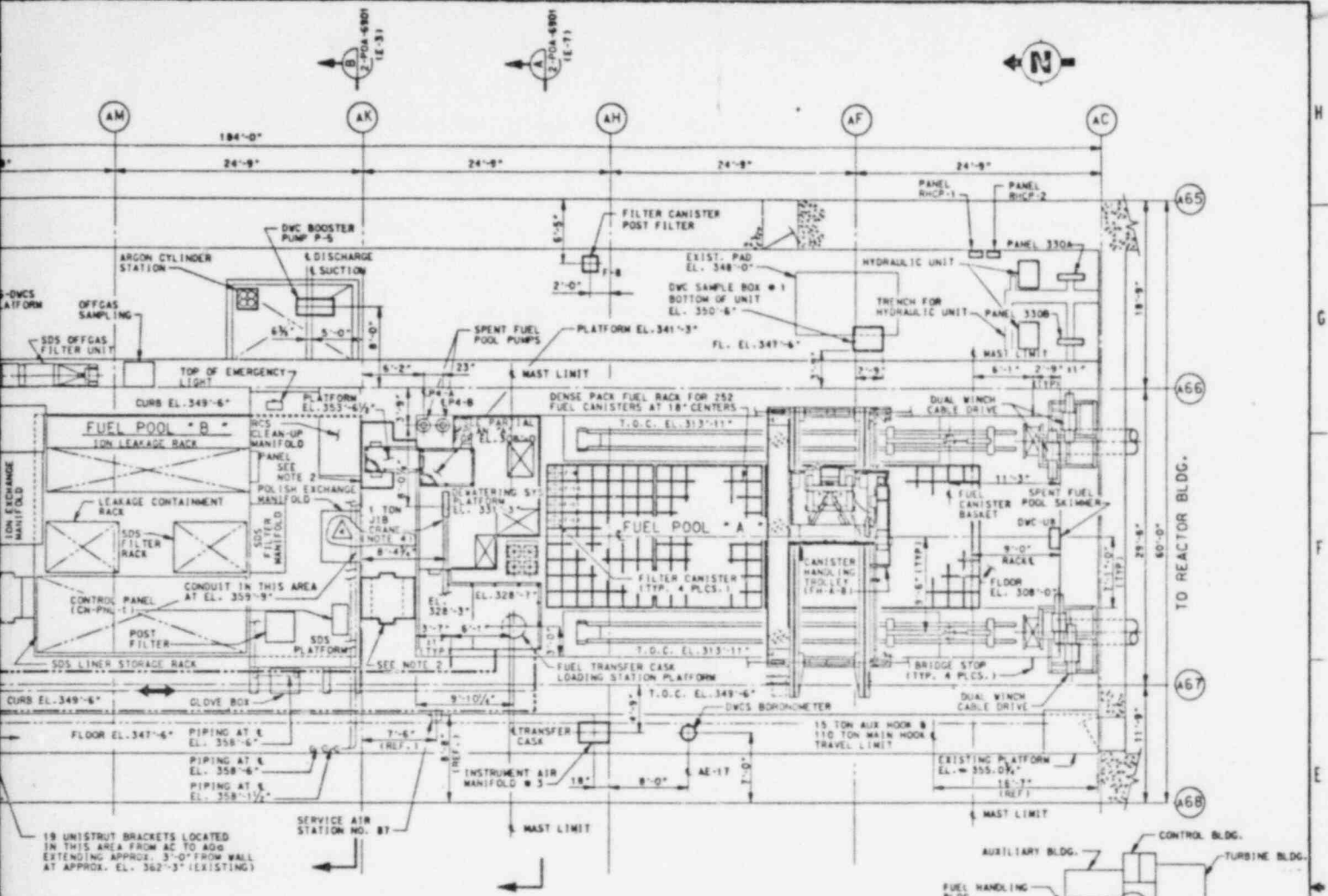
TI
APERTURE
CARDAlso Available C
Aperture Card



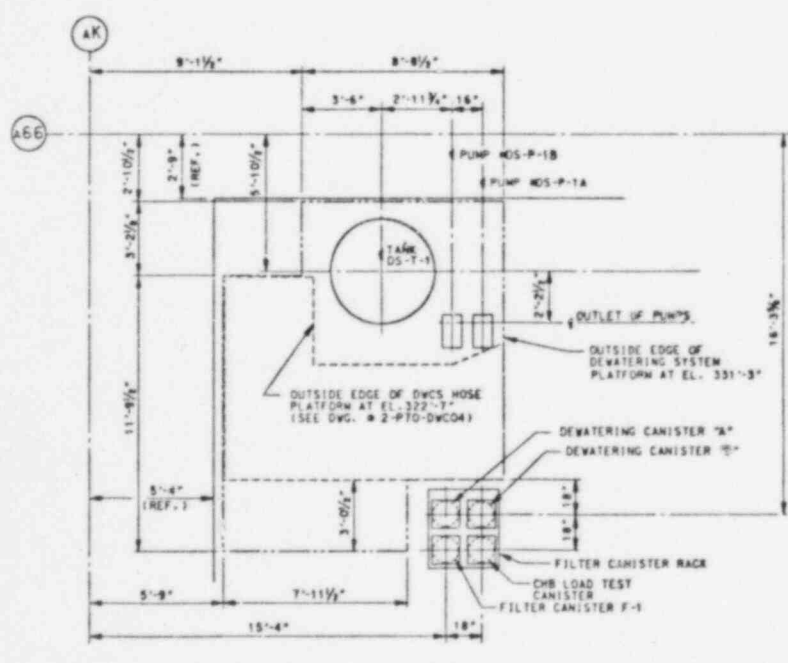
**TI
APERTURE
CARD**

Also Available On
Aperture Card

This drawing and the design it covers are the property of NUCOR. They are hereby loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, leased, exhibited, or used except in the limited way and for the use permitted by the license to the borrower.



PLAN FLOOR EL. 347'-6"
SCALE: 1/8" = 1'-0"



PARTIAL PLAN "A" - EL. 308'-0"
DEWATERING STATION
SCALE: 1/8" = 1'-0"

- LEGEND**
- EXISTING COMPONENTS
 - MATERIAL FLOW PATH
 - NEW COMPONENTS

- NOTES:**
- DELETED
 - PLATFORM TO BE PROVIDED OVER TRANSFER GATE AND FUEL ELEVATOR BETWEEN SPENT FUEL TRANSFER POOL "B" AND SPENT FUEL STORAGE POOL "C" TO PROVIDE ACCESS.
 - DELETED
 - THE DEWATERING SYSTEM (S) JIB CRANE WILL BE SUPPLIED BY FIELD. THE DESIGN REQUIREMENTS ARE AS FOLLOWS:
THE HEIGHT OF THE JIB CRANE FROM THE BOTTOM OF THE BASE PLATE TO THE TOP OF THE ASSEMBLY IS TO BE 18'-3".
THE SPAN, MEASURED FROM THE CENTERLINE OF THE MAST TO THE END OF THE BOOM IS 14'-0".
THE MAXIMUM LOAD TO BE HANDLED IS 200 LBS.
TESTING AND INSPECTION OF THE JIB CRANE WILL BE IN ACCORDANCE WITH APPROVED TMI-2 PROCEDURES.
 - JIB CRANE HAS A DUAL CAPACITY RATING. THE RATING THAT SHALL BE USED FOR ALL LIFTING OPERATIONS ASSOCIATED WITH THE TMI-2 RECOVERY PROGRAM IS 7.5 TONS.

8602190108-04

REVISED TRUCK BAY AREA B ADDED NOTE 5. THE FOLLOWING CHANGE AFFECTS ECA 3255 84-0047 INC. FOR 83-540		5/1/84	1/1/84	1/1/84	1/1/84
ISSUED FOR CONSTRUCTION		J.S. CER	PLN	DRG	---
DATE	BY	REVISED	BY	DATE	BY
10/2/83	J.S. CER	10/2/83	J.S. CER	10/2/83	J.S. CER
DECHTEL GAITHERSBURG, MARYLAND GPU NUCLEAR METROPOLITAN EDISON THREE MILE ISLAND - UNIT 2					
GENERAL ARRANGEMENT FUEL HANDLING BUILDING/TRUCK BAY PLAN FLOOR EL. 347'-6" & EL. 305'-1"					
JOB NO.		DRAWING NO.		REV.	
15737		2-POA-6401		4	

ECA NOS. 15735-84-0041
15736-84-0042
15737-84-0043
15738-84-0044
15739-84-0045
15740-84-0046
15741-84-0047
15742-84-0048
15743-84-0049
15744-84-0050
15745-84-0051
15746-84-0052
15747-84-0053
15748-84-0054
15749-84-0055
15750-84-0056
15751-84-0057
15752-84-0058
15753-84-0059
15754-84-0060
15755-84-0061
15756-84-0062
15757-84-0063
15758-84-0064
15759-84-0065
15760-84-0066
15761-84-0067
15762-84-0068
15763-84-0069
15764-84-0070
15765-84-0071
15766-84-0072
15767-84-0073
15768-84-0074
15769-84-0075
15770-84-0076
15771-84-0077
15772-84-0078
15773-84-0079
15774-84-0080
15775-84-0081
15776-84-0082
15777-84-0083
15778-84-0084
15779-84-0085
15780-84-0086
15781-84-0087
15782-84-0088
15783-84-0089
15784-84-0090
15785-84-0091
15786-84-0092
15787-84-0093
15788-84-0094
15789-84-0095
15790-84-0096
15791-84-0097
15792-84-0098
15793-84-0099
15794-84-0100
15795-84-0101
15796-84-0102
15797-84-0103
15798-84-0104
15799-84-0105
15800-84-0106
15801-84-0107
15802-84-0108
15803-84-0109
15804-84-0110
15805-84-0111
15806-84-0112
15807-84-0113
15808-84-0114
15809-84-0115
15810-84-0116
15811-84-0117
15812-84-0118
15813-84-0119
15814-84-0120
15815-84-0121
15816-84-0122
15817-84-0123
15818-84-0124
15819-84-0125
15820-84-0126
15821-84-0127
15822-84-0128
15823-84-0129
15824-84-0130
15825-84-0131
15826-84-0132
15827-84-0133
15828-84-0134
15829-84-0135
15830-84-0136
15831-84-0137
15832-84-0138
15833-84-0139
15834-84-0140
15835-84-0141
15836-84-0142
15837-84-0143
15838-84-0144
15839-84-0145
15840-84-0146
15841-84-0147
15842-84-0148
15843-84-0149
15844-84-0150
15845-84-0151
15846-84-0152
15847-84-0153
15848-84-0154
15849-84-0155
15850-84-0156
15851-84-0157
15852-84-0158
15853-84-0159
15854-84-0160
15855-84-0161
15856-84-0162
15857-84-0163
15858-84-0164
15859-84-0165
15860-84-0166
15861-84-0167
15862-84-0168
15863-84-0169
15864-84-0170
15865-84-0171
15866-84-0172
15867-84-0173
15868-84-0174
15869-84-0175
15870-84-0176
15871-84-0177
15872-84-0178
15873-84-0179
15874-84-0180
15875-84-0181
15876-84-0182
15877-84-0183
15878-84-0184
15879-84-0185
15880-84-0186
15881-84-0187
15882-84-0188
15883-84-0189
15884-84-0190
15885-84-0191
15886-84-0192
15887-84-0193
15888-84-0194
15889-84-0195
15890-84-0196
15891-84-0197
15892-84-0198
15893-84-0199
15894-84-0200
15895-84-0201
15896-84-0202
15897-84-0203
15898-84-0204
15899-84-0205
15900-84-0206
15901-84-0207
15902-84-0208
15903-84-0209
15904-84-0210
15905-84-0211
15906-84-0212
15907-84-0213
15908-84-0214
15909-84-0215
15910-84-0216
15911-84-0217
15912-84-0218
15913-84-0219
15914-84-0220
15915-84-0221
15916-84-0222
15917-84-0223
15918-84-0224
15919-84-0225
15920-84-0226
15921-84-0227
15922-84-0228
15923-84-0229
15924-84-0230
15925-84-0231
15926-84-0232
15927-84-0233
15928-84-0234
15929-84-0235
15930-84-0236
15931-84-0237
15932-84-0238
15933-84-0239
15934-84-0240
15935-84-0241
15936-84-0242
15937-84-0243
15938-84-0244
15939-84-0245
15940-84-0246
15941-84-0247
15942-84-0248
15943-84-0249
15944-84-0250
15945-84-0251
15946-84-0252
15947-84-0253
15948-84-0254
15949-84-0255
15950-84-0256
15951-84-0257
15952-84-0258
15953-84-0259
15954-84-0260
15955-84-0261
15956-84-0262
15957-84-0263
15958-84-0264
15959-84-0265
15960-84-0266
15961-84-0267
15962-84-0268
15963-84-0269
15964-84-0270
15965-84-0271
15966-84-0272
15967-84-0273
15968-84-0274
15969-84-0275
15970-84-0276
15971-84-0277
15972-84-0278
15973-84-0279
15974-84-0280
15975-84-0281
15976-84-0282
15977-84-0283
15978-84-0284
15979-84-0285
15980-84-0286
15981-84-0287
15982-84-0288
15983-84-0289
15984-84-0290
15985-84-0291
15986-84-0292
15987-84-0293
15988-84-0294
15989-84-0295
15990-84-0296
15991-84-0297
15992-84-0298
15993-84-0299
15994-84-0300
15995-84-0301
15996-84-0302
15997-84-0303
15998-84-0304
15999-84-0305
16000-84-0306
16001-84-0307
16002-84-0308
16003-84-0309
16004-84-0310
16005-84-0311
16006-84-0312
16007-84-0313
16008-84-0314
16009-84-0315
16010-84-0316
16011-84-0317
16012-84-0318
16013-84-0319
16014-84-0320
16015-84-0321
16016-84-0322
16017-84-0323
16018-84-0324
16019-84-0325
16020-84-0326
16021-84-0327
16022-84-0328
16023-84-0329
16024-84-0330
16025-84-0331
16026-84-0332
16027-84-0333
16028-84-0334
16029-84-0335
16030-84-0336
16031-84-0337
16032-84-0338
16033-84-0339
16034-84-0340
16035-84-0341
16036-84-0342
16037-84-0343
16038-84-0344
16039-84-0345
16040-84-0346
16041-84-0347
16042-84-0348
16043-84-0349
16044-84-0350
16045-84-0351
16046-84-0352
16047-84-0353
16048-84-0354
16049-84-0355
16050-84-0356
16051-84-0357
16052-84-0358
16053-84-0359
16054-84-0360
16055-84-0361
16056-84-0362
16057-84-0363
16058-84-0364
16059-84-0365
16060-84-0366
16061-84-0367
16062-84-0368
16063-84-0369
16064-84-0370
16065-84-0371
16066-84-0372
16067-84-0373
16068-84-0374
16069-84-0375
16070-84-0376
16071-84-0377
16072-84-0378
16073-84-0379
16074-84-0380
16075-84-0381
16076-84-0382
16077-84-0383
16078-84-0384
16079-84-0385
16080-84-0386
16081-84-0387
16082-84-0388
16083-84-0389
16084-84-0390
16085-84-0391
16086-84-0392
16087-84-0393
16088-84-0394
16089-84-0395
16090-84-0396
16091-84-0397
16092-84-0398
16093-84-0399
16094-84-0400
16095-84-0401
16096-84-0402
16097-84-0403
16098-84-0404
16099-84-0405
16100-84-0406
16101-84-0407
16102-84-0408
16103-84-0409
16104-84-0410
16105-84-0411
16106-84-0412
16107-84-0413
16108-84-0414
16109-84-0415
16110-84-0416
16111-84-0417
16112-84-0418
16113-84-0419
16114-84-0420
16115-84-0421
16116-84-0422
16117-84-0423
16118-84-0424
16119-84-0425
16120-84-0426
16121-84-0427
16122-84-0428
16123-84-0429
16124-84-0430
16125-84-0431
16126-84-0432
16127-84-0433
16128-84-0434
16129-84-0435
16130-84-0436
16131-84-0437
16132-84-0438
16133-84-0439
16134-84-0440
16135-84-0441
16136-84-0442
16137-84-0443
16138-84-0444
16139-84-0445
16140-84-0446
16141-84-0447
16142-84-0448
16143-84-0449
16144-84-0450
16145-84-0451
16146-84-0452
16147-84-0453
16148-84-0454
16149-84-0455
16150-84-0456
16151-84-0457
16152-84-0458
16153-84-0459
16154-84-0460
16155-84-0461
16156-84-0462
16157-84-0463
16158-84-0464
16159-84-0465
16160-84-0466
16161-84-0467
16162-84-0468
16163-84-0469
16164-84-0470
16165-84-0471
16166-84-0472
16167-84-0473
16168-84-0474
16169-84-0475
16170-84-0476
16171-84-0477
16172-84-0478
16173-84-0479
16174-84-0480
16175-84-0481
16176-84-0482
16177-84-0483
16178-84-0484
16179-84-0485
16180-84-0486
16181-84-0487
16182-84-0488
16183-84-0489
16184-84-0490
16185-84-0491
16186-84-0492
16187-84-0493
16188-84-0494
16189-84-0495
16190-84-0496
16191-84-0497
16192-84-0498
16193-84-0499
16194-84-0500
16195-84-0501
16196-84-0502
16197-84-0503
16198-84-0504
16199-84-0505
16200-84-0506
16201-84-0507
16202-84-0508
16203-84-0509
16204-84-0510
16205-84-0511
16206-84-0512
16207-84-0513
16208-84-0514
16209-84-0515
16210-84-0516
16211-84-0517
16212-84-0518
16213-84-0519
16214-84-0520
16215-84-0521
16216-84-0522
16217-84-0523
16218-84-0524
16219-84-0525
16220-84-0526
16221-84-0527
16222-84-0528
16223-84-0529
16224-84-0530
16225-84-0531
16226-84-0532
16227-84-0533
16228-84-0534
16229-84-0535
16230-84-0536
16231-84-0537
16232-84-0538
16233-84-0539
16234-84-0540
16235-84-0541
16236-84-0542
16237-84-0543
16238-84-0544
16239-84-0545
16240-84-0546
16241-84-0547
16242-84-0548
16243-84-0549
16244-84-0550
16245-84-0551
16246-84-0552
16247-84-0553
16248-84-0554
16249-84-0555
16250-84-0556
16251-84-0557
16252-84-0558
16253-84-0559
16254-84-0560
16255-84-0561
16256-84-0562
16257-84-0563
16258-84-0564
16259-84-0565
16260-84-0566
16261-84-0567
16262-84-0568
16263-84-0569
16264-84-0570
16265-84-0571
16266-84-0572
16267-84-0573
16268-84-0574
16269-84-0575
16270-84-0576
16271-84-0577
16272-84-0578
16273-84-0579
16274-84-0580
16275-84-0581
16276-84-0582
16277-84-0583
16278-84-0584
16279-84-0585
16280-84-0586
16281-84-0587
16282-84-0588
16283-84-0589
16284-84-0590
16285-84-0591
16286-84-0592
16287-84-0593
16288-84-0594
16289-84-0595
16290-84-0596
16291-84-0597
16292-84-0598
16293-84-0599
16294-84-0600
16295-84-0601
16296-84-0602
16297-84-0603
16298-84-0604
16299-84-0605
16300-84-0606
16301-84-0607
16302-84-0608
16303-84-0609
16304-84-0610
16305-84-0611
16306-84-0612
16307-84-0613
16308-84-0614
16309-84-0615
16310-84-0616
16311-84-0617
16312-84-0618
16313-84-0619
16314-84-0620
16315-84-0621
16316-84-0622
16317-84-0623
16318-84-0624
16319-84-0625
16320-84-0626
16321-84-0627
16322-84-0628
16323-84-0629
16324-84-0630
16325-84-0631
16326-84-0632
16327-84-0633
16328-84-0634
16329-84-0635
16330-84-0636
16331-84-0637
16332-84-0638
16333-84-0639
16334-84-0640
16335-84-0641
16336-84-0642
16337-84-0643
16338-84-0644
16339-84-0645
16340-84-0646
16341-84-0647
16342-84-0648
16343-84-0649
16344-84-0650
16345-84-0651
16346-84-0652
16347-84-0653
16348-84-0654
16349-84-0655
16350-84-0656
16351-84-0657
16352-84-0658
16353-84-0659
16354-84-0660
16355-84-0661
16356-84-0662
16357-84-0663
16358-84-0664
16359-84-0665
16360-84-0666
16361-84-0667
16362-84-0668
16363-84-0669
16364-84-0670
16365-84-0671
16366-84-0672
16367-84-0673
16368-84-0674
16369-84-0675
16370-84-0676
16371-84-0677
16372-84-0678
16373-84-0679
16374-84-0680
16375-84-0681
16376-84-0682
16377-84-0683
16378-84-0684
16379-84-0685
16380-84-0686
16381-84-0687
16382-84-0688
16383-84-0689
16384-84-0690
16385-84-0691
16386-84-0692
16387-84-0693
16388-84-0694
16389-84-0695
16390-84-0696
16391-84-0697
16392-84-0698
16393-84-0699
16394-84-0700
16395-84-0701
16396-84-0702
16397-84-0703
16398-84-0704
16399-84-0705
16400-84-0706
16401-84-0707
16402-84-0708
16403-84-0709
16404-84-0710
16405-84-0711
16406-84-0712
16407-84-0713
16408-84-0714
16409-84-0715
16410-84-0716
16411-84-0717
16412-84-0718
16413-84-0719
16414-84-0720
16415-84-0721
16416-84-0722
16417-84-0723
16418-84-0724
16419-84-0725
16420-84-0726
16421-84-0727
16422-84-0728
16423-84-0729
16424-84-0730
16425-84-0731
16426-84-0732
16427-84-0733
16428-84-0734
16429-84-0735
16430-84-0736
16431-84-0737
16432-84-0738
16433-84-0739
16434-84-0740
16435-84-0741
16436-84-0742
16437-84-0743
16438-84-0744
16439-84-0745
16440-84-0746
16441-84-0747
16442-84-0748
16443-84-0749
16444-84-0750
16445-84-0751
16446-84-0752
16447-84-0753
16448-84-0754
16449-84-0755
16450-84-0756
16451-84-0757
16452-84-0758
16453-84-0759
16454-84-0760
16455-84-0761
16456-84-0762
16457-84-0763
16458-84-0764
16459-84-0765
16460-84-0766
16461-84-0767
16462-84

201-16412

